REMARKS

This Amendment and Response has been filed to address the Office Action having a mailing date of January 30, 2009. Claim 1, 3, 4, 6, 9, 13, 14, 39, 50, and 51 have been amended without intending to abandon or to dedicate to the public any patentable subject matter. Claim 15 was previously canceled. Accordingly, claims 1-14 and 16-54 are currently pending.

Applicants would first like to thank the Examiner for courtesies extended on May 12, 2009, during which Applicants' representative and the Examiner conducted a telephonic interview discussing the pending claims and the cited prior art. During that discussion the Examiner indicated that the addition of certain features related to the control data would be favorably treated. Applicants have clarified in certain claims that the control data in the measurement packet contains instructions that direct a receiver to change its operating parameters (*i.e.*, the instructions cause the receiver to change its own operating parameters directly) as opposed to general instructions that may be read by a user and then the user may alter the operating parameters of the device. No agreement was reached regarding allowable subject matter.

Claim Objections

Claim 51 has been objected to for containing certain informalities. Claim 51 has been amended to correct the identified informalities. Accordingly, the objection to claim 51 should be reconsidered and withdrawn.

Rejections under 35 U.S.C. § 103

The Examiner rejects all claims under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,793,976 [hereinafter "Chen"] in view of one or more of U.S. Patent No. 5,892,754 [hereinafter "Kompella"], U.S. Patent No. 6,078,953 [hereinafter "Vaid"], U.S. Patent No. 6,078,953 [hereinafter "Vaid"], U.S. Patent No. 6,385,198 [hereinafter "Ofeck"], U.S. Patent No. 6,963,914 [hereinafter "Breitbart"], U.S. Patent No. 5,271,000 [hereinafter "Engbersen"], U.S. Patent No. 6,757,255 [hereinafter "Aoki"], and U.S. Patent No. 6,751,661 [hereinafter "Kogan"].

In order for a rejection under 35 U.S.C. §103 to be proper, clear articulation of the reason(s) why the claimed invention would have been obvious should be stated by the Examiner and must be supported by some rationale which may include one of the following: A) Combining prior art elements according to known methods to yield predictable results; (B) Simple substitution of one known element for another to obtain predictable results; (C) Use of known technique to improve similar devices (methods, or products) in the same way; (D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (E) "Obvious to try" - choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; (F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art; or (G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention. The Supreme Court noted in *KSR v. Teleflex* that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. (MPEP §2143). The Examiner has not, however, shown that the pending claims are obvious in view of any of the above-listed rationales. Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

Applicants respectfully disagree with the rejection of claims 1-14, 16-18, 21-22, 24-31, 34-49, and 53-54 as being unpatentable over Chen in view of Kompella. As previously discussed, Chen is generally directed toward performance monitoring in a computer network. More specifically, Chen describes modifying management packets at intermediate communication nodes (*e.g.*, a switch) along a virtual connection (*i.e.*, a Virtual Path Connection or Virtual Channel Connection). The management packets are used to measure and report end-to-end QoS along a particular virtual connection.

In operation Chen teaches that a switch can modify the payload of the management packet and locally measure delay and packet loss. The information field in the management packet is where this modification occurs. More particularly, the information field in Chen is taught to contain a timestamp field, a delay-stamp field (for

accounting end-to-end delay as well as node-by-node delay), and a packet loss count field (for accounting end-to-end delay as well as node-by-node delay).

The local delay measured at any switch is calculated as the difference between the arrival time and the departure time of a given packet (*i.e.*, the amount of time that a packet is at a given node). *See* Chen col. 4, ll. 40-43. The end-to-end delay is accumulated by incrementing a value ***by the local delay measured at each switch***. Thus, the end-to-end delay measured in Chen is only indicative of the delay introduced ***at each intermediate node*** and not the overall delay for a particular packet. In other words, Chen does not teach calculating the transmission delay (*i.e.*, the delay between intermediate nodes). Chen also teaches accounting for node-by-node delay, but this value, again, only accounts for delay encountered at each intermediate node.

The packet loss measured at any switch is determined by the switch counting the number of user packets ***discarded*** by the switch (intentional non-treatment of a user packet typically occurring because there is no further device for the switch to transfer the packet to) within a virtual connection since the previous loss management packet arrived. The value in the packet loss count field is incremented by this amount and forwarded on to the next intermediate node in the virtual connection. This accounting of end-to-end packet loss in a particular measurement packet is determined by summing the number of user packets dropped at each intermediate node since the last measurement packet was received at each of those nodes. This method of calculating packet loss is subject to a great amount error since it is based on a pure addition of packets discarded at a particular intermediate node between times in which that particular intermediate node has received measurement packets. Chen also teaches accounting for node-by-node packet loss, but this value, again, only accounts for packets discarded

The present invention, on the other hand, provides mechanisms for determining unintentional packet loss over a given network path. Those skilled in the art will appreciate that network packet loss is different from intentional packet loss at a particular node in a network. Additionally, embodiments of the present invention are adapted to compute averages, deviations, and/or variances in certain performance characteristics. Chen is not capable of performing any such determinations since delays and packet discards are calculated on a per-packet basis and there is no calculation of statistics based

on data contained in multiple packets. Furthermore, embodiments of the present invention are adapted to transmit a plurality of measurement packets as a measurement stream. This particular feature is also not described in Chen.

Kompella does not overcome these shortcomings of Chen. Kompella has only been cited to overcome the fact that Chen does not disclose directing a receiver of a packet to change one or more configuration parameters of the receiver. Applicants respectfully submit that neither Chen nor Kompella teach, suggest, describe, or make obvious at least the following italicized features of the independent claims:

> 1. A method for communicating data within measurement traffic, the method comprising:
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> sending a plurality of one or more measurement packets over a plurality of one or more paths, *each of the first plurality of one or more measurement packets having a common source and destination IP address,* each of the plurality of one or more paths traversing at least a portion of an internetwork, and each of the plurality of one or more measurement packets including:
>
> *information for a receiver of the measurement packet to compute measurements of performance characteristics of at least a portion of the path of the measurement packet, and data including control data comprising instructions that direct a receiver of the measurement packet to change one or more configuration parameters of the receiver, the data further including one or more of measurement statistics, a generic communication channel, and network information.*

> 4. A method for communicating data within measurement traffic, the method comprising:
>
> *receiving a plurality of one or more measurement packets over a plurality of one or more paths, each of the plurality of one or more measurement packets being assigned a sequence number from a range of sequence numbers*, each of the plurality of one or more paths traversing at least a portion of an internetwork, and each of the plurality of one or more measurement packets including:
>
> *information for a receiver of the measurement packet to compute measurements of performance characteristics of at least a portion of the path of the measurement packet, the information including the assigned sequence number,*
>
> *data including control data directing a receiver of the measurement packet to change one or more configuration parameters of the receiver, the data further including one or more of measurement statistics, a generic communication channel, network information.*

9. A method for communicating data within measurement traffic, the method comprising:

sending a first plurality of one or more measurement packets over a first plurality of one or more paths, each of the first plurality of one or more measurement packets having a common source and destination IP address, each of the first plurality of one or more paths traversing at least a portion of an internetwork, and each of the first plurality of one or more measurement packets including:

information for a receiver of the measurement packet to compute measurements of performance characteristics of at least a portion of the path of the measurement packet, the performance characteristics including at least one of averages, deviations, and variances determined by analyzing at least two of the first plurality of one or more measurement packets,

data including control data directing a receiver of the measurement packet to change one or more configuration parameters of the receiver, the data further including one or more of measurement statistics, a generic communication channel, network information,

receiving a second plurality of one or more measurement packets over a second plurality of one or more paths, each of the second plurality of one or more paths traversing at least a portion of an internetwork, and each of the second plurality of one or more measurement packets including:

information for a receiver of the measurement packet to compute measurements of performance characteristics of at least a portion of the path of the measurement packet, and

data including control data directing a receiver of the measurement packet to change one or more configuration parameters of the receiver, the data further including one or more of measurement statistics, a generic communication channel, network information.

39. A networking system, comprising:

a plurality of one or more devices communicating at least a first plurality of one or more measurement packets over a first plurality of one or more paths, each of the plurality of one or more measurement packets being assigned a sequence number from a range of sequence numbers, each of the first plurality of one or more paths traversing at least a portion of an internetwork, and each of the first plurality of one or more measurement packets including:

information for a receiver of the measurement packet to compute measurements of performance characteristics of at least a portion of the path of the measurement packet, the performance characteristics including at least one of averages, deviations, and variances determined

> *by analyzing at least two of the plurality of one or more measurement packets, and*
> *data including control data directing a receiver of the measurement packet to change one or more configuration parameters of the receiver, the data further including one or more of measurement statistics, a generic communication channel, network information.*

In addition to the above, Applicants still maintain that Chen and Kompella are not combinable references under 35 U.S.C. § 103. More particularly, Kompella teaches methods of altering the operation of a user application (40-42) at an endnode. *See* Kompella Fig. 2 describing that the user applications 40-42 reside on a "typical packet network endnode." As the name suggests, the user applications reside on user devices in a communication network. Chen, on the other hand, teaches operations of intermediate network nodes. Chen is not at all concerned with nor does it describe the operation of a network endnode. Thus, the combination of these references is improper.

Applicants respectfully submit that, assuming *arguendo*, if Chen and Kompella were combinable under 35 U.S.C. § 103, the combination of Chen and Kompella would still not lead one skilled in the art to arrive at the claimed invention (at least not without improper hindsight). More specifically, at most Chen only teaches accounting for delay and packet discards at a particular intermediate node in a network and combining those node-based values to arrive at an accumulated (end-to-end) node-based delay and discard value. If Chen were combined with Kompella, one skilled in the art would only reach a system that includes node-based and per-packet-based performance metrics in a measurement packet which can be compared against QoS thresholds by a user application at an endnode. As one example, a combination of Chen and Kompella would not lead one skilled in the art to arrive at a measurement packet that contains control data directing a router to change one or more of its configuration parameters. *See e.g.* pending claim 51.

In addition to the above, Kompella only describes a self-modifying user application that alters its own behavior based on whether or not measured QoS parameters violate a lower QoS bound. Contrary to the Examiner's assertion, there is no suggestion in Kompella to provide a measurement packet that directs a receiver to change its configuration parameters. Kompella only teaches including QoS parameters in a

generic packet. These QoS parameters are used as inputs to a control algorithm residing on the user application that makes a determination as to whether or not a change in behavior is required. The messages transmitted in Kompella do not include control data that includes instructions which direct the receiver to change its configuration parameters. Accordingly, at least based on the above, the independent claims appear to be in condition for allowance.

In addition to being dependent from an allowable independent claim, the dependent claims provide further reasons for allowance. For instance, dependent claim 3 provides that measurement statistics include at least one of averages, deviations, and variances determined by analyzing at least two of the plurality of one or more measurement packets. As noted above, Chen is incapable of calculating such measurement statistics since the measurements taken in Chen are packet specific.

As another example, dependent claim 6 provides that the data in a measurement packet includes measurement statistics calculated for a given path between a sender and the receiver. Chen is not capable of calculating such a measurement statistic as Chen only describes taking delay or packet discard values on a per-node basis, which is not fully indicative of a path statistic.

As yet another example, dependent claim 12 provides that one the measurements statistics is at least partly responsive to jitter. While Kompella does describe considering jitter as a QoS input to its user application behavior modification algorithm, Kompella does not teach, suggest, describe, or make obvious including such information in a measurement packet. Chen is the only reference that provides a discussion of measurement packets including measurement statistics and Chen is not capable of calculating jitter as such a calculation would have to be based on more than one packet. Furthermore, one skilled in the art would not have thought to modify Chen to calculate jitter since Chen is only calculating statistics on a per-packet basis.

As still another example, dependent claim 13 provides that the measurement statistics are at least partly responsive to path delay. This feature is not described or made obvious by Chen since it only calculates delay at an intermediate node.

As still another example, dependent claim 14 provides that the measurement statistics are at least partly responsive to loss deduced by identifying missing sequence

numbers. Again, this feature could not possibly be made obvious by Chen since it only calculates packet discarding on a per-packet basis, without considering packet sequence.

As still another example, dependent claim 20 provides a mechanism for synchronizing clocks between a receiver and sender. While Ofeck does generally describe how synchronized clocks would allow and endpoint to measure delay time, Ofeck cannot be properly combined with Chen. More specifically, Chen explicitly teaches that the delay calculated at a given intermediate node is the delay between when a packet is received and when it is transmitted. There is no concern of the delay between nodes. Therefore, there is no need or want of a synchronized clock in Chen. Simply citing Ofeck does not lead one skilled in the art to modify Chen. Rather, such a combination of references would just synchronize the time stamps at each node. The way in which Chen calculates delay would not be altered due to the teaching in Ofeck.

As still another example, dependent claim 50 recites combining delay and jitter into a single value. As noted above, the system described in Chen is incapable of calculating jitter. Furthermore, Chen is incapable of calculating average values since all metrics calculated in Chen are calculated on a per-packet basis. Additionally, Breitbart only teaches combining mean latency with its reliability of the estimate into a single metric (*e.g.*, providing a single metric as an average value with a standard deviation). This is not the same as combining two different statistics calculated based on information from two or more different packets.

As still another example, dependent claim 51 recites that the receiver, which is responsive to control data in a measurement packet, comprises a router. This feature is explicitly taught away from in Kompella and not taught in Chen. Thus, their combination in this regard is improper. Engbersen and Aoki do not overcome the shortcomings of Kompella and Chen. Rather, Engbersen only teaches including start and stop control data in a test packet, not in a measurement packet. Aoki is similarly deficient in that Aoki only teaches changing the size of a measurement packet, it does not teach including instructions as control data in a measurement packet to cause the packet's recipient to change the size of measurement packets transmitted therefrom.

As still another example, dependent claim 54 provides that the measurement statistics are at least partly responsive to jitter, delay, and loss. This particular feature is

not possible given the teachings of Chen (*i.e.*, since Chen is incapable of computing jitter and including such information in its measurement packet).

Based on the foregoing, Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,
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